



DoD Installations, Energy and the Environment: The Challenge—and Opportunity

Dorothy Robyn
Deputy Under Secretary of Defense
(Installations and Environment)
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"Federal Leadership in Environmental, Energy and Economic Performance"

Acquisition, Technology and Logistics



- Gives federal agencies 90 days to set 2020 greenhouse gas (GHG) reduction goal
- Sets targets for sustainable buildings water efficiency, waste reduction
- Expands green procurement (\$500B/year in purchasing power)



Key Points

Acquisition, Technology and Logistics

- Meeting the sustainability challenge is in DoD's self interest.
- This is especially the case with respect to energy and climate change, which can act as a "threat multiplier."
- With sufficient investment, innovation, and attention to economic incentives, DoD is well positioned to be a "solutions multiplier."





Proactive Approach vs Environmental Risk

Proactive vs Reactive

Acquisition, Technology and Logistics

**Early Emerging
Contaminant Actions**

\$\$\$

Small investment here



\$\$\$

Large impact here



QDR: DoD Needs a Strategic Approach to Energy/Climate Change

Acquisition, Technology and Logistics

- Climate change and energy will play a significant role in shaping the future security environment.
- Climate change may act as an accelerant of instability and conflict.
- Energy efficiency can serve as a “force multiplier.”

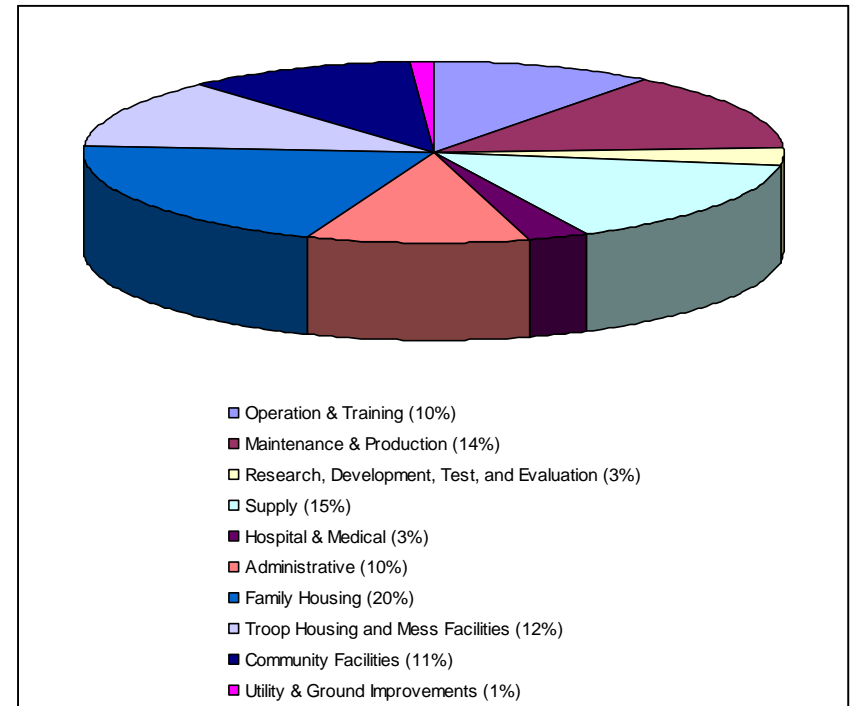




DoD Built Infrastructure

Acquisition, Technology and Logistics

- 539,000 Facilities (buildings, structures, linear structures)
 - 307,295 buildings
 - o 2.2 B sq ft
- Comparisons
 - GSA: 1,513 government buildings
 - o 176 M sq ft
 - Wal-Mart US: 4,200 buildings
 - o 687 M sq ft
- 160,000 Fleet Vehicles



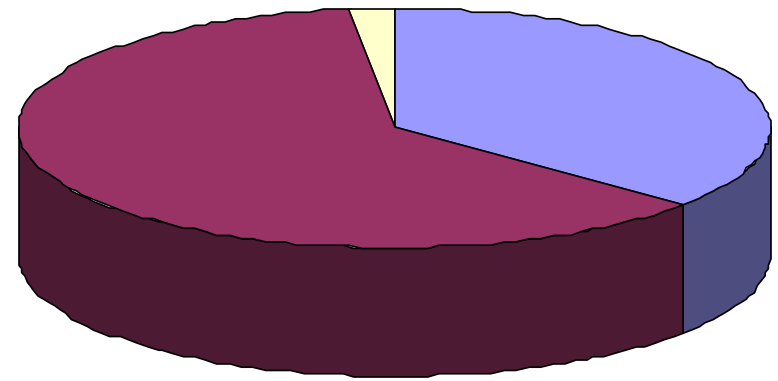


DoD Energy Use

Acquisition, Technology and Logistics

- \$13.4B direct costs in 2009
 - \$9.8B fuel
 - o Current optempo high
 - \$3.8B facilities
 - o 64% electricity purchases
- 2008 Cost: \$20B
- Energy GHG Emission
 - 73.5 million MT CO₂eq in 2008
 - o 1.3% of US emissions
 - o Would be in top 40 countries

GHG (CO₂eq)



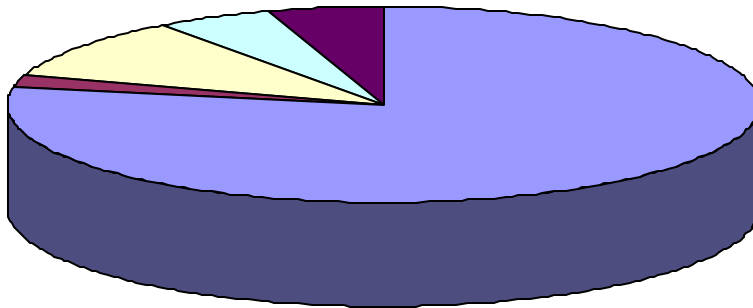
- Facility (36%)
- Mobility & generators (62%)
- Fleet fuel: non-tactical (2%)



Army Energy GHG Emissions

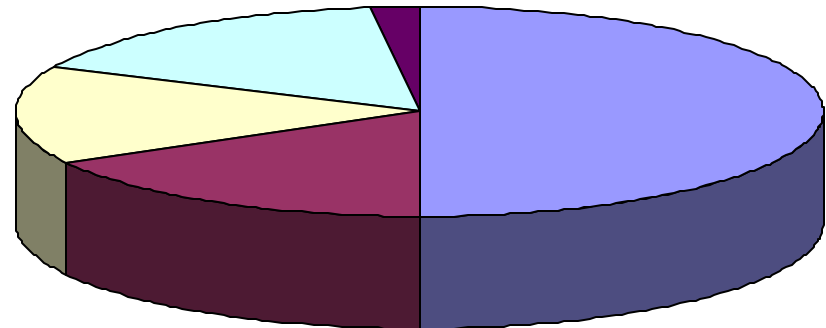
Acquisition, Technology and Logistics

Future footprint? (CO_{2e})



- Facilities (77%)
- Generators (2%)
- Combat Aircraft (10%)
- Tactical Vehicles (5%)
- Non-tactical Vehicles (5%)

Current Optempo (CO_{2e})



- Facilities (50%)
- Generators (17%)
- Combat Aircraft (15%)
- Tactical Vehicles (16%)
- Non-tactical Vehicles (2%)



Energy Security

Acquisition, Technology and Logistics

- Defense Science Board Report, Feb 2008
 - DoD's reliance on a fragile commercial electricity grid places continuity of critical missions at serious and growing risk.
 - Most installations lack the ability to manage their demand for and supply of electrical power and are thus vulnerable to power disruption due to natural disasters, cyberattacks, and overload of the grid.
- Changing role of military installations—which now provide more “reachback” support for combat operations—accentuates this concern



DoD Facility Energy Strategy

Acquisition, Technology and Logistics

- Reduce impediments, such as flawed economic incentives
- Increase investment in the 3 “I’s”:
 - Infrastructure
 - Innovation
 - Information



Impediments to Doing More, Better

Acquisition, Technology and Logistics

- Flawed economic incentives impede investment in energy efficiency
 - “Split incentives” (capital investment vs O&M)
 - Inability to keep savings from reduced energy consumption
- Lack of information
 - DoD lacks an enterprise-wide energy information management system
- Efforts to exploit and leverage DOE investments are limited and uncoordinated
- Little DoD R&D on installation energy



Investment in Infrastructure

Acquisition, Technology and Logistics

- Reduce demand--energy efficiency and conservation
 - One-sixth of SRM dollars (\$1.7B/yr) going to energy efficiency retrofits
 - Leveraging Milcon budget (\$20B+)
 - o LEED Silver
 - o 30% above ASHRAE standards
 - Energy Conservation Investment Program (ECIP)
 - o FY10: \$174M, FY11: \$120M
- Increase supply of renewable energy sources
- Private financing is key
 - ESPCs/ESCOs
 - EULs and PPAs



Reducing Demand: Energy Efficiency

Acquisition, Technology and Logistics

- “Energy efficiency is not just the low hanging fruit; it’s the fruit laying on the ground” – Steve Chu
- Retrofit: high efficiency HVAC, energy mgt control systems, improved lighting, water-reducing devices



Compact Fluorescents
at Pearl Harbor
Bachelors Enlisted Quarters



Daylighting: Ramstein Air Base, Germany

Acquisition, Technology and Logistics







Investment in Innovation: Testbed Initiative

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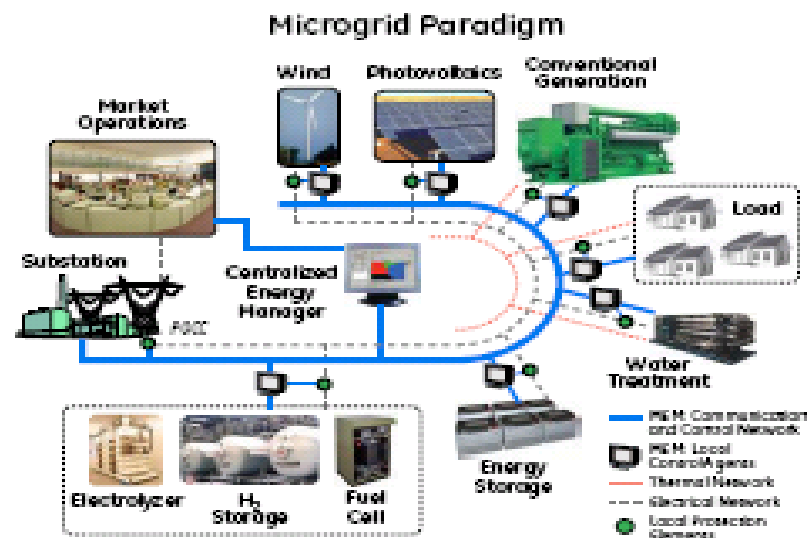
- DoD facilities can serve as testbed for new energy technologies
 - DoD's built infrastructure is unique for its size and variety, which captures the diversity of building types and climates in U.S.
 - Facilities can serve two key roles in which military has excelled
- Sophisticated first user
 - Validate performance, cost, and environmental impacts
 - Directly reach out to private sector for innovations
 - Leverage Department of Energy investments
- Early customer
 - Transfer lessons learned, design and procurement information across all Services and installations
 - Help create a market, as with aircraft, electronics and the internet
- ESTCP is doing this on a small scale

Smart Micro-Grid



DESCRIPTION

- Enhance and demonstrate an advanced micro grid technology for DoD installations
 - Optimal dispatch
 - Load shedding
 - Intentional islanding
 - Energy management
- Demonstrate cost and performance at 29 Palms



BENEFITS/METRICS

- Allow secure islanding of DoD installation and reduce costs of electricity
- Increase use renewables, energy efficiency and reduce carbon footprint

FUNDING

\$2M

- Awarded through competitive solicitation
- GE Global Research
 - leverages DOE and GE investments

Continuous Building Commissioning

DESCRIPTION

- Objectives are to demonstrate whole-building modeling and monitoring systems capable of:
 - 1) identifying, classifying, and quantifying energy and water consumption deviations from design intent or optimal,
 - 2) identifying the causes of those deviations, and
 - 3) recommending, prioritizing, and implementing corrective actions
- Naval Base Ventura County, McGuire AFB, & CERL

BENEFITS/METRICS

- Demonstrations will document energy savings, costs, reliability and applicability to DoD buildings.
- Successful implementation of this technology will enable reduced energy consumption, peak electric demand, and water use in DoD buildings by providing actionable information to facility managers and building operators.

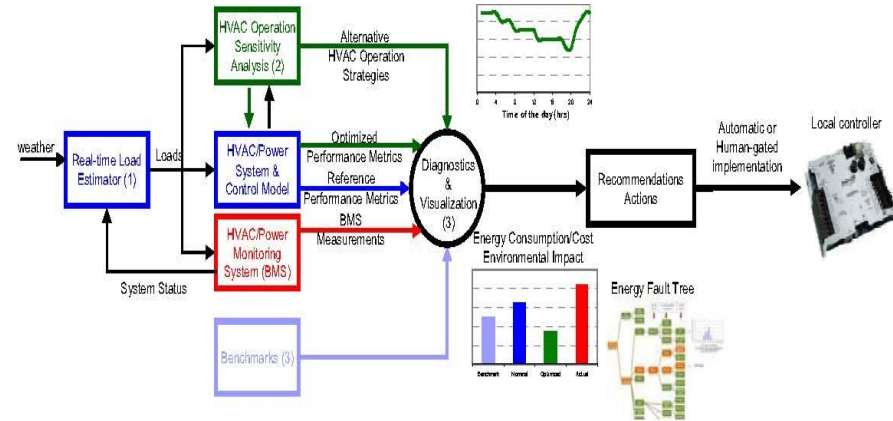


Figure 1. Block diagram of the proposed Advanced Building Energy Management Systems

FUNDING

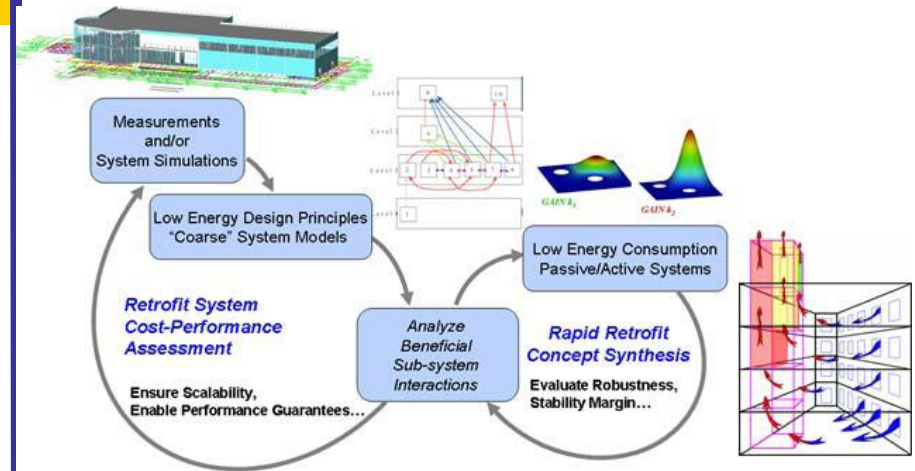
\$3.2M

- Awarded through competitive solicitation
- United Technologies Research Center
- Lawrence Berkeley National Laboratory
- University of California, Berkeley
- Oak Ridge National Laboratory

Systems Approach to High Performance Buildings

DESCRIPTION

- Develop and evaluate advanced scalable methodologies and tools for design and analysis of low energy systems for DoD building retrofits
 - Failure Mode Effects Analysis
 - Whole Building Computational Modeling
 - System Decomposition and Analysis Tools
 - Critical Parameter Management tools



BENEFITS/METRICS

- Efficiency gain of 50% in existing buildings
 - Reduce energy costs
 - Reduced carbon footprint
 - Supports net zero energy installation

FUNDING

\$3.3M

- Awarded through competitive solicitation
- United Technologies Research Center
- Virginia Tech
- AimDyn
- Building Intelligence Group
- Robust systems and Strategy



Innovation Needed: Wind Farms/Radar

Acquisition, Technology and Logistics

- Wind turbines can cause interference with radar
 - Implications for LRRs and military test/training ranges
- DoD relies on the FAA's obstacle evaluation process to review proposed projects
 - Almost all proposed turbines approved so far
 - But potential for interference is growing
- DoD must not slow the growth of this new industry
 - Improvements to FAA review process can help
 - But, ultimately, answer is better mitigation technology



Current Statutory & Regulatory Targets

Acquisition, Technology and Logistics

- By 2015, reduce facility energy demand 30% (2003 baseline)
- By 2015, reduce petroleum use in non-tactical vehicles by 20% (2005 b/l)
- By 2020, reduce water use 26% (2008 b/l)
- By 2025, increase supply of renewable energy 25% (2005 b/l)
- By 2020, reduce GHG emissions by 34% (2008 b/l)



Wave power buoy
testing at
MCB Kaneohe Bay



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DoD's Strategic Sustainability Performance Plan

Acquisition, Technology and Logistics

Vision: Maintain our ability to operate into the future without decline - either in the mission or in the natural and manufactured systems that support DoD's mission.

Built on
4 Key
Mission
Oriented
Themes

Continued Availability
of Resources

DoD is a US Gov't
Leader in reducing
GHGs



Minimize Waste &
Pollution

Mgm't & Practices
Built on Sustainability
and Community



DoD Sustainability Goals

Acquisition, Technology and Logistics

Reduce Use of Fossil Fuels

- Reduce energy intensity
- Increase use of renewable sources
- Reduce vehicle fleet consumption



Reduce Greenhouse Gas Emissions

Scope 1 and 2 by 34%
Scope 3 by 13.5%

Improve Water Resources Management



Minimize & Optimally Manage Solid Waste



Minimize Chemicals of Concern



Sustainability is Built into DoD Management Systems & Becomes the Norm